Revision of the Metrargini (Hemiptera, Lygaeidae)

ROBERT L. USINGER

UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA

AND

PETER D. ASHLOCK

ENTOMOLOGY RESEARCH DIV., A.R.S.
U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D.C.

(Presented at the meeting of December 15, 1958)

The tribe Metrargini is unique, being confined to the Hawaiian Archipelago. It may be definitely classed as one of the archaic Hawaiian groups and exhibits typical insular radiation, breaking up into groups varying in degree from distinct genera to scarcely distinguishable variations. Zimmerman summarized the published information up to 1948 and gave original keys and figures. In the present paper descriptions are given of the new species which have accumulated in collections since the time of Kirkaldy and an attempt is made to work out distributional patterns and phylogeny.

Tribe **Metrargini** (Kirkaldy), 1902

Elongate oval or more nearly parallel; the head strongly elevated and closely punctate above and beneath; eyes strongly exserted, not touching the pronotum; ocelli distinct except in some brachypterous specimens, located near hind margin of head; antennae long and slender: rostrum reaching to or well beyond hind coxae. Pronotum variable in form, distinctly punctate except for callosities. Scutellum rather coarsely punctate and more or less strongly elevated at middle. Clavus and corium superficially punctate except for the usual two rows of deep punctures along claval suture. Corial veins distinct even in the brachypterous *villosa,* with Sc distinct and complete, reaching apical margin of corium, traversing the dilated costal area, R + M branching at apical fourth, Cu simple, unbranched in the corium. Membrane, in macropterous species, large, with three simple longitudinal veins in outer half, the usual branching vein arising near Cu, and a short inner vein that may be an anal vein crossing over the claval suture. Wings with hamus complete and decurrent, two apical veins well-developed. Ostiolar canals

short, straight, auriculate, surrounded by a dull evaporating area. Punctures of pleura extending on coxal flanges and even superficially onto postero-lateral margins of metapleura. Meso- and meta-sterna longitudinally grooved at middle. Second (first visible) ventral segment of abdomen largely concealed; third and fourth segments long, with trichobothria inserted near the middle; fifth and sixth segments, as in *Orsillini,* shorter, deeply emarginate for the reception of the ovipositor, with a pair of lateral trichobothria; seventh ventral segment with only a single trichobothria-bearing tubercle on either side. Abdominal spiracles all located dorsally on the connexivum and concealed by the expanded hemelytra. Ventral abdominal sutures all more or less complete and reaching lateral margins. Male genital capsule deeply foveate posteriorly.

Color fulvous to brown or dark fuscous, the head and sometimes other portions of the body black. Femora alternately ringed with fulvous and white and the joints between segments, at least of the antennae, pale. Hemelytra sometimes pale, spotted throughout.

Type genus: *Metrarga* Buchanan White

Basically very similar to the Orsillini but very different in appearance, being much broader and flatter; the hind margin of sixth tergite in the male subtruncate; the coxal flanges punctate; and vein Sc of the corium complete. *Metrarga* nymphs have a dorsal abdominal scent gland at the hind margin of the fourth and fifth tergites as in other Lygaeinae (Usinger, 1939).

Biology

Although the Metrargini have been known for nearly a century and over 200 specimens have been collected, knowledge of the biology is scanty. Kirkaldy (1907) described the nymphs and Perkins (1913) recorded his personal collecting notes and observations as follows:

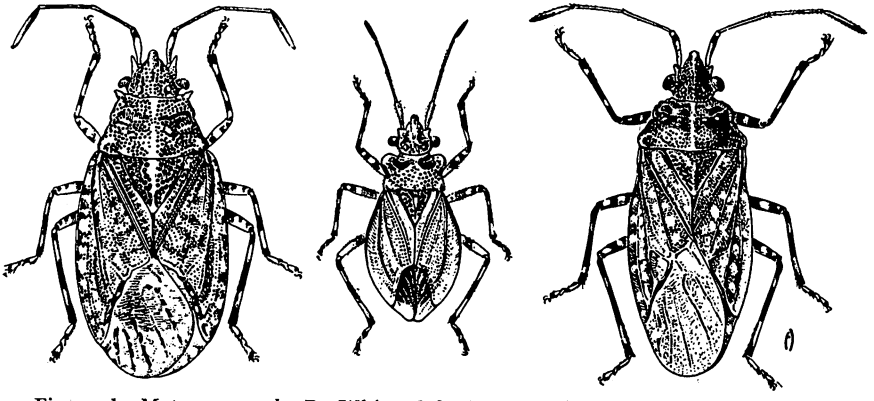


Figure 1. *Metrarga nuda* B. White, left. *Nesocryptias oahuensis,* n. sp., middle. *Nesoclimacias contracta* (Blackburn), right. (From Zimmerman, 1948).

Figure 2. Ieie vine (*Freycinetia arborea* Gaud.) growing on the crest of the Koolau mountains behind Honolulu. (From Williams, 1936).

"The winged species are often notably gregarious, a dozen to scores congregating together at the base of the leaves of a single plant of *Freycinetia*. The nymphs occur in the same situation, sometimes mixed with the adults. These winged species may also be found on the ground amongst dead leaves or fragments of fern fronds, while the flightless *M. villosa* seems to have taken entirely to a terrestrial life, and perhaps became flightless in accordance with these habits. It is remarkable that amongst large flocks of one of the winged species (e.g. *contracta*) one or two examples of another species (*nuda*) are sometimes found, so that the flocks are mixed. The odour of the species is disgusting, when a colony is disturbed, and taints the surrounding air. While the representatives of *M. nuda* that are found on Hawaii, Oahu, and Maui are very similar, it is noteworthy that the Molokai form, although of precisely similar habits, is more distinct in appearance superficially."

Records since Perkins' time tend to confirm his observations as to *Freycinetia* (ieie vine) being a host: *molokaiensis, swezeyi, contracta, lanaiensis,* and *oahuensis* having been taken in this way. Even *villosa,* which Perkins considers "to have taken entirely to a terrestrial life" was collected by the senior author (see under *oahuensis*) at the bases of leaves of the plant figured by Williams (PROC. HAW. ENT. SOC. 9:331, fig. 7, 1936) (fig. 2). However, additional host plant records have since been recorded as follows: *nuda—Metrosideros, Cibotium, Euphorbia; obscura* —Tree fern, *Tetraplasandra; villosa—Myoporum, Byronia; adamsoni— Osmanthus.*

Stridulation

In the typical genus *Metrarga* the costal margin of each hemelytron is minutely crenulate (fig. 3), the crenulations extending for a short distance as fine striations on the under surface of the wing. Immediately opposed to this on the inner apical portion of each hind femur is an area of small tubercles that could be interpreted as a scraper. Whether the file-like costal margin serves as a strigil and the hind femur as a plectrum is a matter of conjecture because sound production has not been reported for these bugs. However, similar structures have been observed in the Pyrrhocorid, *Arhaphe* (Lattin, 1958) and in other Lygaeids (Ashlock and Lattin, 1960). Thus this type of stridulatory mechanism (if that is what it is proved to be) is widely scattered in the Lygaeid bugs and must be assumed to have arisen independently in several groups.

The Phallus in the Metrargini

The phalli of the type species of all three genera display all of the basic characters of the orsilline phallus: lateral dorsal phallothecal processes absent; sclerotized area present distally on the conjunctiva; strong tendency for reduction of the ejaculatory reservoir; completely asymmetrical vesica with unpaired lobes, one of which is pigmented.

In a previous paper (Ashlock, 1957) it was suggested that the phallus of the Metrargini might differ from that of the Orsillini in the divided condition of the sclerotized region of the metrargine conjunctiva. At the time only *Nesoclimacias contracta* was available for study. Now that the types of all three genera have been investigated, this conclusion must

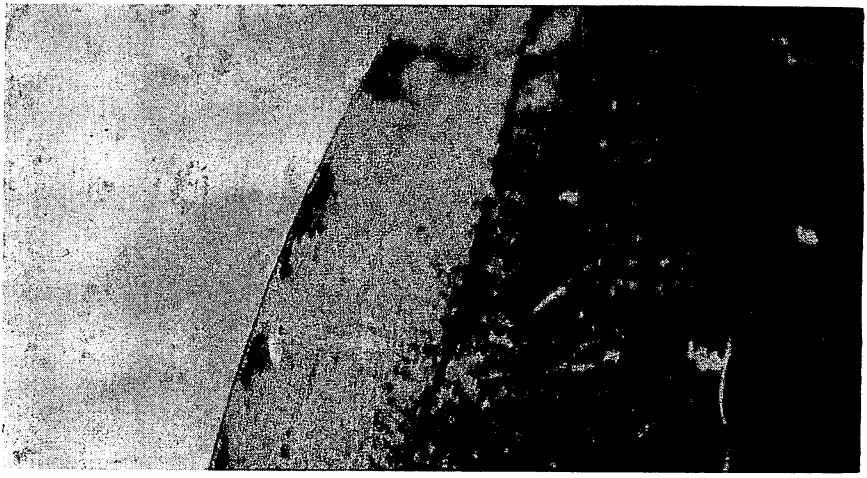


Figure 3. *Metrarga nuda* B. White. Costal margin of hemelytron in side view, showing finely crenulate strigil.

be discarded, since the character is not present in the type genus of the tribe.

The characters of the phalli (fig. 4) strengthen the phylogenetic relationships indicated by the key to genera below. In *Metrarga nuda* the phallotheca lacks sclerites; the conjunctiva has rounded lateral lobes just beyond the middle; the distal pigmented area extends completely around the ventral surface; the ejaculatory reservoir retains rudiments of the "wings"; and the vesica has three lobes, including the pigmented one, that extend from the main axis of the phallus.

In *Nesoclimacias contracta* and *Nesocryptias villosa,* the phallothecae possess sclerites on their ventral surfaces; the conjunctivae are without medial lateral lobes; the distal pigmented areas are separated into two lateral ventral lobes; the ejaculatory reservoirs lack "wings" and are reduced to the point of barely indicating the juncture of the conjunctival seminal duct to the vesical seminal duct; and the vesicae have two basal lobes, one pigmented, followed by elongate tubular twisted areas.

Differences in the appearance of the stapes at the base of all these phalli should not be taken too seriously, since they must be observed through the membranes and muscles connecting the phallus with the genital capsule. The phallus of the *Metrarga* illustrated is perhaps under-inflated, and the distal area of the vesica of the *Nesoclimacias* phallus appears to be over-inflated. Several specimens of *Nesoclimacias* burst under osmotic pressure before this example was obtained.

No new character emerges from the above to separate the Metrargini from the Orsillini. The lateral unpigmented lobes on the conjunctiva of the *Metrarga* phallus have not been reported before in the orsillines, but differently placed unpigmented lobes have recently been found on the conjunctiva of the phallus of *Oceanides nimbatus* (Kirk.).

Taxonomic Position of the Orsillines

In a recent revision of the cymine tribe Ninini, Scudder (1957) makes the following statement. "The tribe Ischnorhynchini is transferred from Cyminae to Orsillinae, the latter being regarded distinct from Lygaeinae." He gives no evidence to support these changes.

A number of workers have indicated characters which would support Scudder's view that the Orsillini are not related to the Lygaeini. Slater and Hurlbutt (1957, p. 69) found that the metathoracic wings of members of the Lygaeini have a subcostal vein. This is unique within the family Lygaeidae. Ashlock (1957, p. 419) states: "From the evidence obtained by study of the male genitalia, it would appear that the Lygaeini and Orsillini are not at all related." Characters of the pullus of the Lygaeini, as contrasted to those of the Orsillini are:

Lateral phallothecal processes present; conjunctiva without sclerites; ejaculatory reservoir apparently always complete; vesica basally symmetrical with lobes paired, and distally coiled, exceptionally wrinkled

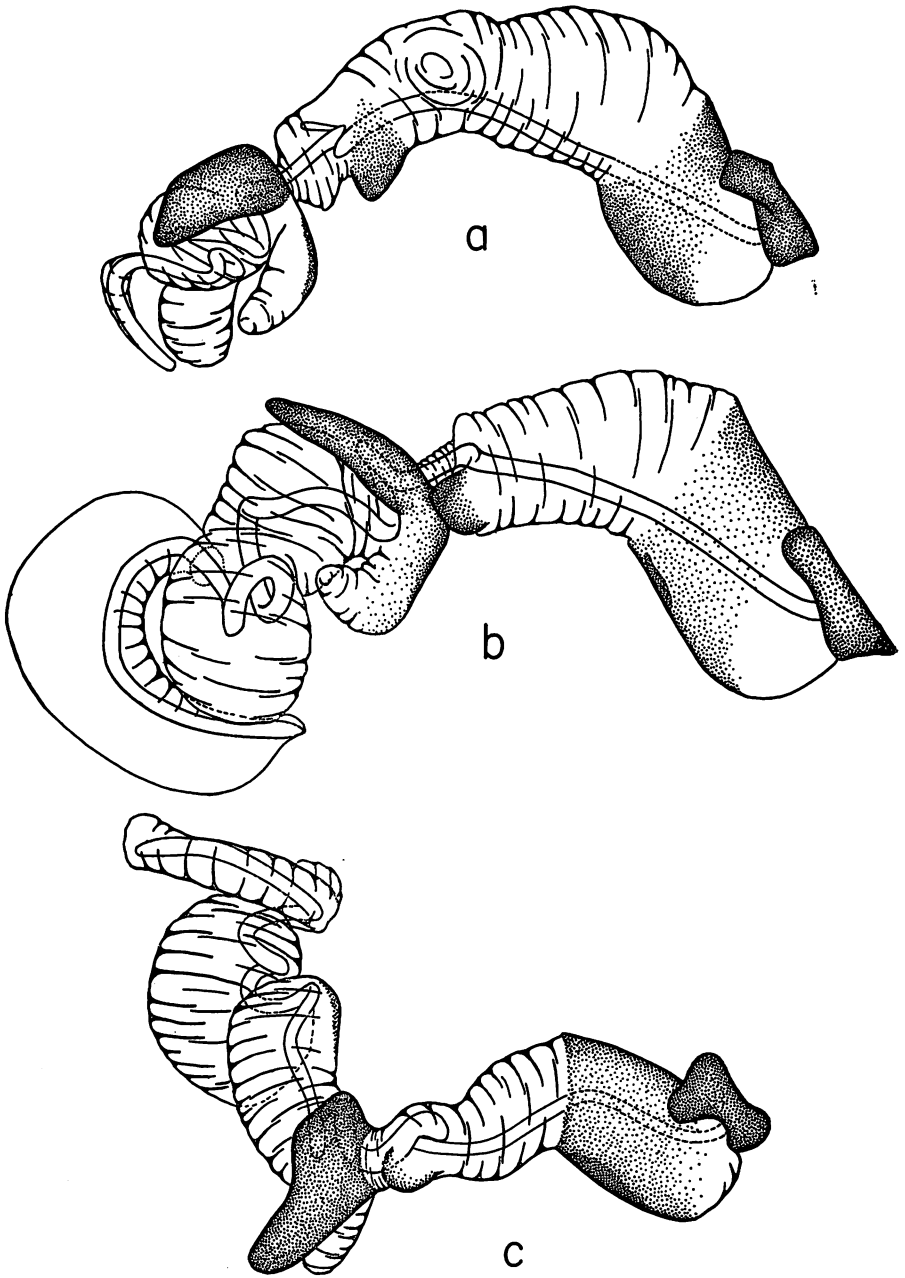


Figure 4. Phalli of: a) *Metrarga nuda* B. White, b) *Nesocryptias villosa* B. White (Oahu, Blackburn), c) *Nesoclimacias contracta* (Blackburn).

and bearing a sclerite on inner surface of coil, the two areas separated by a sclerite, frequently ring shaped; gonoporal process bearing a tiny or elongate apical process beyond the secondary gonopore.

Southwood (1956, pp. 192-4) described the eggs of the Lygaeini as having eleven to fourteen micropylar processes that are comparatively large and clavate, while the eggs of the Orsillini have only three to six micropylar processes that are papilliform or clavate, but very small. In discussing the Orsillini he states: ". . . this tribe deserved higher status than commonly accepted," and "Leston (*personal communication*) is also of the opinion that the Lygaeini and Orsillini are not consubfamilial and points out that the cytology (as elucidated by Pfaler-Collander, 1941) and other data support this view."

To the traditional external characters[1] the following may be added:

Orsillini. Ovipositor long and ventrally displacing segments seven to five or four anteriorly; male genital capsule with a deep ventral fovea; ostiolar peritreme elongate, extending at least one-third (usually halfway) up side of metathorax; evaporative area round peritreme extensive.

Lygaeini. Ovipositor short, ventrally displacing segment seven slightly or not at all; male genital capsule with two shallow or no ventral foveae; ostiolar peritreme shorter, not extending more than one-third up side of metathorax, or ostiole without a peritreme; evaporative area quite reduced or commonly absent.

Scudder's contention that the Ischnorhynchini are not related to the other two tribes of the Cyminae (Cymini and Ninini) also can be supported easily from published data. Slater and Hurlbutt (1957, p. 69) feel that the division of this subfamily into the Ischnorhynchini and Cymini is untenable and state: ". . . the Ischnorhynchini wing is very generalized, whereas in the Cymini and in *Ninus* and its allies, the hind wing shows the most specialized condition in the entire family." Ashlock (1957, p. 416) states: "The appearance of the phallic structures indicates that the two tribes differ (in this respect, at least) more from one another than do the lygaeines from the orsillines." Southwood (1956, p. 194) states: "The egg of *Kleidocerys* [Ischnorhynchini] shows that this genus cannot be included in the same subfamily as *Cymus*. This is supported by the general morphology (Gulde, 1936) and the cytology (Pfaler-Collander, 1941) . . ."

Usinger (1942, p. 16) states that: "*Metrarga* is structurally every similar to the Orsillini but is very different in appearance, being much broader and flatter, the antenniferous tubercles sharply produced as stout spines,

[1] These are: Lygaeini; apical margin of corium straight, antenniferous tubercles obtuse or subobtuse: Orsillini; apical margin of corium deeply sinuate, antennal tubercles acute or subacute.

the posterior margin of sixth tergite in the male subtruncate, the coxal flanges punctate and corial vein Sc distinct throughout its length and evidently complete, joining apical margin of corium near apex. As pointed out by H. G. Barber (personal correspondence) this group certainly deserves no more than tribal rank within the Lygaeinae."

The authors believe that the orsillines really should be given subfamily rank, and that the Hawaiian Metrargini, and the monobasic Robinsonocorini from Juan Fernandez Island (Kormilev, 1952), as well as the Orsillini proper should be included in the subfamily. But we can find no reason for Scudder's placement of the Ischnorhynchini in the Orsillinae.

The only similarities known to us are the dorsally situated spiracles and the long ovipositor, both of which characters occur in other subfamilies in the Lygaeidae. Nearly all other characters are quite different, particularly the eggs, the phalli, the punctation of the hemelytra, the posterior margin of the corium, the veins of the clavus and corium, apparent or not, etc. Thus, we are unable to agree with Scudder's conclusions and prefer to recognize the following subfamilies: 1) the Lygaeinae, 2) the Orsillinae (including Metrargini, Orsillini, and Robinsonocorini), 3) the Cyminae (including Cymini and Ninini,) and 4) the Ischnorhynchinae.

Key to the Genera of Metrargini

1. Pronotum toothed or angulately produced antero-laterally. Costal margins dilated from the bases of hemelytra, with strigil consisting of fine striations extending a short distance under expanded margin ..... **Metrarga**
   Pronotum rounded or roundly lobed antero-laterally. Costal margins dilated beyond basal fifth, without a strigil 2
2. Membrane complete, as wide as corium ..... **Nesoclimacias**
   Membrane greatly reduced, about half as wide as corium ..... **Nesocryptias**

Genus **Metrarga** Buchanan White

Metrarga B. White, 1878, Ann. Mag. Nat. Hist. (5) 1:370.
Metrarga, Kirkaldy, 1908, Proc. Haw. Ent. Soc. 1:189 (as subgenus).
Metrarga, Kirkaldy, 1910, Fauna Haw. 2:535 (as subgenus).
Metrarga, Zimmerman, 1948, Ins. Hawaii 3:107 (as genus).

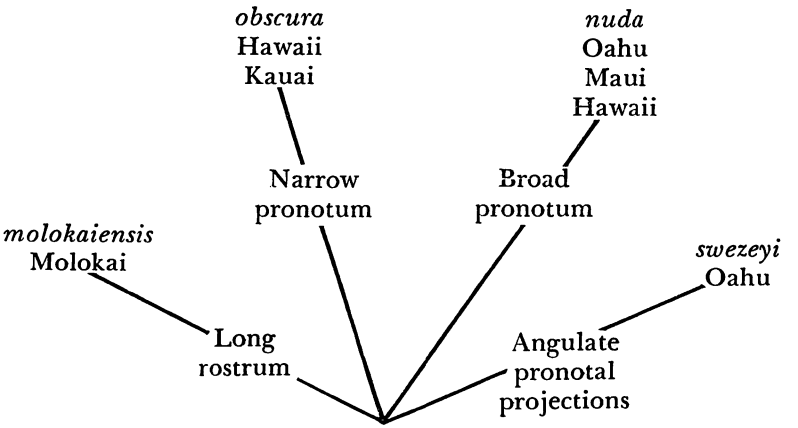
Rather broad and subflattened above, and only moderately convex beneath. Antenniferous tubercles distinctly, often strongly produced.

Rostrum not surpassing middle of abdomen, the first segment not or scarcely exceeding base of head. Pronotum relatively broad, distinctly narrowed anteriorly, the sides sinuate, antero-lateral angles either acutely produced or extending as small angular lobes behind eyes. Scutellum broader at base than long, the commissure of clavus about 2/3 as long as scutellum. Hemelytra broadly expanded, the costal areas of coria dilated from the base, the margins with fine cross-striations forming a strigil. Membrane large but not greatly extended beyond level of apices of coria, broader than greatest width of corium, extending not or scarcely more than half as far beyond level of apices of coria as length in front of this. Hind wings complete, fully developed. Body inconspicuously pubescent above except occasionally on head and front lobe of pronotum. Parameres relatively long, roundly elbowed and attenuated apically. Size 6-9 mm.

Type of Genus: *Metrarga nuda* Buchanan White.

Typical *Metrarga* has been reported from all the islands except Lanai, where it will doubtless be discovered with further collecting.

The known distribution of the species of *Metrarga* is not consistent with the present geographic arrangement of the islands. Thus *obscura* occurs at opposite ends of the main island chain whereas the most distinctive species of all, *molokaiensis,* occurs on the middle island. Possibly further collecting of these rare insects will fill in gaps and explain some of the anomalies in distribution. That the species concept is sound is attested by the occurrence of both *nuda* and *obscura* in the same series collected by Perkins at Kona on the island of Hawaii. Thus the two closest species that run to the same couplet in the key appear to be sympatric. *Nuda* and *swezeyi* may also occur together on Oahu since they have both been reported from the Waianae Mountains.



Relationships of the species of *Metrarga*

KEY TO THE SPECIES OF METRARGA

1. Rostrum long, reaching base of fourth (third visible) abdominal segment. Pronotum shorter than head. Femora all brown ..... **molokaiensis**

   Rostrum short, not surpassing hind coxae. Pronotum longer than head. Color light brownish ferrugineous or pale ochraceous 2

2. Antero-lateral angles of pronotum produced as angulate, anteriorly rounded lobes. Antennae short, much less than half again as long as head and pronotum together (219:180). Color pale, ochraceous, with light brown marks and punctures. Oahu ..... **swezeyi**

   Antero-lateral angles of pronotum produced as slender, acute spines. Antennae longer, over half again as long as combined length of head and pronotum (258:160). Color fulvous to ferrugineous 3

3. Width across pronotal spines greater than width across eyes. Anterior lobe of pronotum broadly dilated (Fig. 5a). Oahu, Maui, Hawaii ..... **nuda**

   Width across pronotal spines equal to or less than width across eyes. Front lobe of pronotum less strongly dilated (Fig. 5d). Hawaii, Kauai ..... **obscura**

Metrarga molokaiensis, new species

Body form elongate-oval, the surface glabrous with only very short, sparse, inconspicuous hairs above on clavus and corium.

Head wider across eyes than long, 79:70; eyes over one-fourth as wide as interocular space, 14:52. Ocelli prominent. Antenniferous tubercles short, blunt. Antennae long, exceeding greatly the combined lengths of head and pronotum, 232:132; proportion of segments one to four 40:70:67:55. Rostrum reaching onto fourth (third visible) abdominal segment, the first segment exceeding base of head; proportion of segments one to four 65:65:63:50.

Pronotum shorter than head on median line, 61:70, twice as wide across humeri as long, 120:61; disk only moderately raised at middle and broadly depressed on either side anteriorly. Antero-lateral spines acutely produced laterad and slightly forward; antero-lateral margins evenly sinuate (fig. 5c).

Hemelytra with costal margins moderately expanded.

Color rather uniform, brown above with black head, darker brown on anterior lobe of pronotum and ill-defined pale marks on costal margins. In clearly marked specimens there are ivory spots at middle of anterior

and posterior margins of pronotum, at apex of scutellum and at extreme base of vein R + M on corium. Antennae pale brown, the first segment darker and joints between segments paler. Under surface brown with pale on bucculae and ostiolar peritreme. Rostrum pale brown. Legs with trochanters pale, femora entirely brown. Tibiae brown with ill-defined pale areas subbasally and subapically. Tarsi pale basally.

Size: male, length 6.75 mm., width (pronotum) 2 mm.; female, length 8.2 mm., width (pronotum) 2.2 mm.

Holotype male, allotype female, and five male and three female paratypes: Molokai, 2500 ft. Febr. 1902, on *Freycinetia* (R. C. L. Perkins), (B. P. Bishop Museum). In addition there are two males and a female from the Perkins collection labelled "Molokai" and one female, Molokai, H. Isls. Aug. 26, 1909, (D. T. Fullaway).

This species is closest to *obscura* but differs strikingly in body form, color, length of rostrum, etc.

Metrarga swezeyi, new species

Body elongate-oval. Surface shining, appearing naked but with very fine, appressed hairs at sides and base of head, in front of pronotal callosities and at basal angles of scutellum. Also with very short, inconspicuous, sparse hairs on coria.

Head a little wider across eyes than long, 29:25; ratio of width of interocular space to width of an eye 58:14. Vertex finely punctured. Ocelli prominent. Antenniferous tubercles short but distinct, about as long as wide at base, blunt at apices. Antennae longer than head and pronotum together, 202:170; proportion of segments one to four 31:66:60:45. Rostrum reaching hind coxae, the first segment not attaining base of head; proportion of segments one to four 50:55:55:42.

Pronotum at middle one-third longer than head (32:25); less than twice as wide across humeri as long, 56:32; disk strongly elevated with a shallow depression at middle and broadly depressed antero-laterally; antero-lateral angles prominent, flattened, produced laterad and a little forward behind eyes; antero-lateral margins strongly sinuate behind this fig. 5b) and abruptly so at middle.

Hemelytra with costal margins only moderately expanded.

Color pale yellow brown above with head black, pronotum ochraceous with brown callosities and punctures, scutellum brown with pale apex, hemelytra pale and subhyaline with numerous brown spots on corium and ill-defined spots on membrane. Under surface brown. Antennae brown with pale joints between segments. Rostrum brown with black apex. Legs brown with pale apical third of femora ringed subapically with brown; tibiae broadly pale subbasally and subapically; tarsi pale basally.

Size: male, length 8 mm., width (pronotum) 2.75 mm.; female, length 8.5 mm., width (pronotum) 3 mm.

Holotype: male, Waianae Mts., Oahu, July, 1955, (E. J. Ford, Jr.), (B. P. Bishop Museum). Allotype: female, Palikea, Oahu, June 30, 1935, *Freycinetia* (F. X. Williams), (B. P. Bishop Museum). Paratypes: one female, Pukaloa Valley, Waianae Mts. Oahu, March 22, 1936 (R. L. Usinger); one male, Mt. Kaala, Oahu, July 21, 1929 (F. X. Williams); one female, Nanakuli, Oahu, Febr. 14, 1938 (Geo. Mau).

Swezeyi is very close to typical *nuda* but has a dictinctive facies and may be separated by the broader differently shaped antero-lateral spines of pronotum, the shorter antennae, and the pale color. Thus far it has been taken only in the Waianae mountains, whereas *nuda* occurs both in the Waianae and in the Koolau Mountains.

Metrarga nuda Buchanan White

Metrarga nuda B. White, 1878, Ann. Mag. Nat. Hist. (5) 1:371.
Metrarga nuda var. *mauiensis* Kirkaldy, 1908, Proc. Haw. Ent. Soc. 1:188.

Body relatively broadly oval. Surface of head and pronotum around callosities with a very fine, inconspicuous pubescence of appressed hairs. Clavus and corium with very short, sparse pubescence as seen at a magnification of 27X.

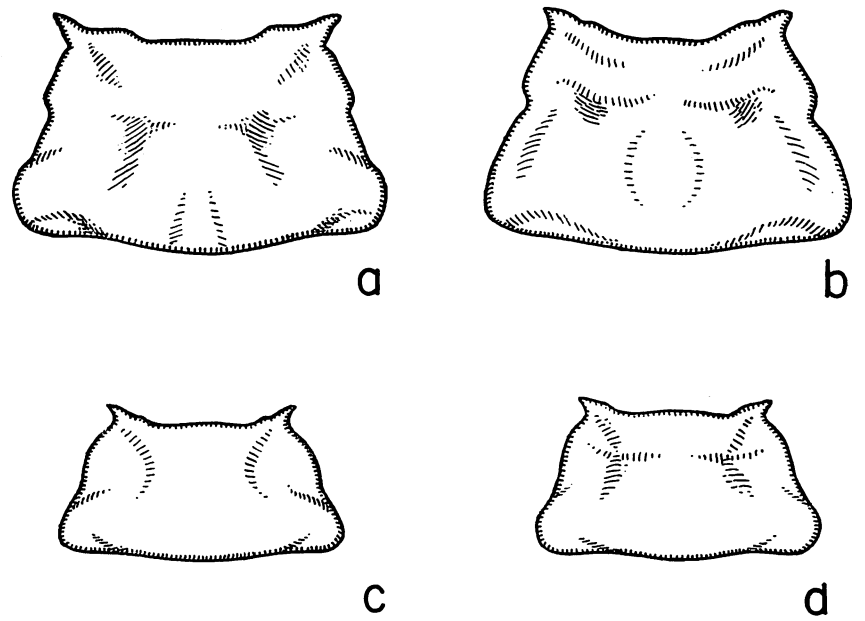


Figure 5. Pronota of: a) *Metrarga nuda* B. White, b) *Metrarga swezeyi*, n. sp., c) *Metrarga molokaiensis*, n. sp., d) *Metrarga obscura* Blackburn.

Head distinctly wider across eyes than long on median line, 98:74; eyes over one-fourth as wide as interocular space, 17:64. Vertex so densely punctured that the punctures exceed in area the raised portions between punctures. Antenniferous tubercles relatively long, twice as long as wide at base, subacute. Ocelli prominent. Antennae long, over half again as long as combined lengths of head and pronotum (258:160); the proportion of segments one to four 45:75:70:68. Rostrum reaching to hind coxae, the first segment attaining base of head; proportion of segments one to four 60:56: 18:43.

Pronotum distinctly longer than head on median line, 89:74; less than twice as wide across humeri as long, 157:89. Disk raised and then subflattened at middle of hind lobe, broadly depressed on either side anteriorly. Antero-lateral spines prominent, subacute; antero-lateral margins abruptly bent at middle (fig. 5a).

Hemelytra with costal margins strongly dilated from the base.

Color pale brown above with black head, dark brown callosities, clavus and corium pale and subhyaline with numerous brown spots. Membrane hyaline and brown-spotted. Tips of antenniferous spines and pronotal spines, midline and humeri on pronotum, apex of scutellum and vein R + M at base ivory. Antennae brown with pale joints. Under surface brown with pale bucculae, acetabular margins, ostiolar peritreme and lamellate hind margins of metapleura. Rostrum dark brown at apex. Legs with pale trochanters. Femora pale with a median and a subapical brown ring. Tibiae brown at base, middle and apex. Tarsi brown apically.

Size: male, length 7.75 mm., width (pronotum) 2.75 mm.; female, length 9.3 mm., width (pronotum) 3.2 mm.

The type, a male, Honolulu No. 20 (No. 24 under the card) is in the British Museum (Nat. Hist.).

Redescribed from the male plesiotype figured in Zimmerman (1948, fig. 39). The latter specimen is from Haleauau, Oahu, Sept. 14, 1930, Koa (O. H. Swezey). A specimen is before us from the Blackburn collection labelled "*Metrarga nuda* 24". It is from "Oahu". Nine specimens are at hand from the Perkins collection, from Honolulu Mtns. 1800 ft. Oct. 1903 and other localities near Honolulu. Three of these are labelled "Fauna Hawaiiensis collection" and a fourth, collected by Perkins in 1893, is from "Kaala Mts.", Oahu. Additional material includes over two dozen specimens, mostly from Tantalus in the Koolau Range and Haleauau in the Waianae Mtns. The sizes given above span approximately the range seen in our series.

Kirkaldy (1908) described the variety *mauiensis,* but four specimens from Haleakala, 4000 ft. (R. C. L. Perkins); Mahena, Oct. 13, 1926 (O. H. Swezey); Iao Valley, Sept. 24, 1896, (O. Koebele Coll.) seem to fall well within the range of variation of typical Oahu specimens. Two specimens in the British Museum from Iao Valley, 1894 (Perkins) are a little paler and less marked but are not worthy of a separate name.

Metrarga obscura Blackburn

Metrarga obscura Blackburn, 1888, PROC. LINN. SOC. N. S. WALES 3:347.

Body form relatively broadly elongate-oval. Surface with fine, appressed hairs, visible at 27X magnification on head, sides of pronotum, scutellum and hemelytra.

Head wider across eyes than long, 82:65; eyes over one-fourth as wide as interocular space, 15:54. Ocelli prominent. Antenniferous tubercles about twice as long as wide at base, subacute. Antennae long, over half again as long as combined lengths of head and pronotum, 230:132; proportion of segments one to four 43:66:63:58. Rostrum reaching hind coxae, the first segment not attaining base of head; proportion of segments one to four 55:50:44:42 (measured on female from Kilauea, R. C. L. Perkins).

Pronotum a little longer than head on median line, 68:65; less than twice as wide across humeri as long, 126:68; disk only moderately elevated and a little depressed at middle of hind lobe. Antero-lateral spines short, the distance across apices equal to or less than width of head across eyes. Antero-lateral margins rather evenly sinuate. (fig. 5d).

Hemelytra with costal margins moderately to strongly expanded.

Color brown above with black head and with pale spots at apices of antenniferous tubercles and pronotal spines, along middle of pronotum and on humeri, at apex of scutellum, and with pale spots on hemelytra as in *nuda*. Under surface and appendages brown, the femora mostly brown with an ill-defined pale ring beyond middle and another subapically.

Size: male, length 6.5 mm., width (pronotum) 2.2 mm.; female, length 7.75 mm., width (pronotum) 2.5 mm.

Redescribed from a male in the Perkins collection, Olaa, Hawaii, 1500 feet, July 1903. Also before us are a male and female, presumably from the type series in the Blackburn collection, marked with the symbol for Hawaii and labelled "*Metrarga obscura* 121" beneath the cards to which the specimens are affixed. Ten additional specimens are before us, all from Hawaii: Kilauea, Mauna Kea, Kona, collected by Perkins and Swezey.

Obscura is very close to *nuda* but has shorter pronotal spines and is consistently smaller and darker.

A single male from Kokee, Kauai, August 20, 1925 (O. H. Swezey) will key out here but has an entirely different type of pubescence. Its placement must be regarded as tentative at this time.

Genus **Nesoclimacias** Kirkaldy

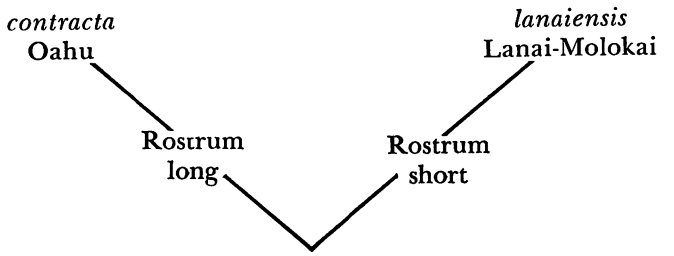
Nesoclimacias Kirkaldy, 1908, PROC. HAW. ENT. SOC. 1:189 (as subgenus).

Nesoclimacias Kirkaldy, 1910, FAUNA HAW. 2:534 (as subgenus).
Nesoclimacias, Zimmerman, 1948, INS. HAWAII 3:109 (as genus).

Long and relatively narrow, the sides thus appearing subparallel, subflattened above, and moderately convex below. Antenniferous tubercles very briefly produced as rounded lobes, scarcely exceeding bases of antennae. Rostrum exceedingly long, reaching to or beyond third visible abdominal segment. Pronotum narrowed anteriorly, the sides sinuate and rounded antero-laterally to front margin. Scutellum broader than long; commissure of clavus about 2/3 as long as scutellum. Hemelytra complete, subparallel along basal fifth, beyond which the costal margins are moderately, arcuately dilated. Costal margins not minutely crenulate (strigil). Membrane complete, extending over half again as far beyond apices of coria as its length before this, broader than width of corium. Hind wings complete, well-developed. Pubescence inconspicuous above except at base of scutellum, surrounding callosities, and on head. Parameres relatively long, roundly elbowed at middle and attenuated apically. Size 7 to 9 mm.

Type of genus: *Metrarga contracta* Blackburn.

Nesoclimacias is reported only from the adjacent islands of Oahu, Molokai, and Lanai.



Relationships of the species of *Nesoclimacias*

KEY TO THE SPECIES OF NESOCLIMACIAS

1. Rostrum reaching nearly or quite to fifth visible abdominal segment, the first segment nearly attaining level of front coxae. Oahu ..... **contracta**

   Rostrum much shorter, not surpassing third visible abdominal segment, the first segment reaching only to anterior fourth of prosternum. Lanai, Molokai ..... **lanaiensis**

Nesoclimacias contracta (Blackburn)

Metrarga contracta Blackburn, 1888, PROC. LINN. SOC. N. S. WALES 3:347.

Metrarga (Nesoclimacias) contracta var. *picea* Kirkaldy, 1908, PROC. HAW. ENT. SOC. 1:188.

Body form elongate with sides, at bases of hemelytra, subparallel. Surface appearing glabrous but with fine hairs on sides of head and pronotum, around callosities, and very short and sparse hair on scutellum and hemelytra.

Head wider across eyes than long, 90:80; eyes over one-fourth as wide as interocular space, 17:55. Ocelli prominent. Antenniferous tubercles obsolescent, shorter than width at base and rounded at apices. Antennae very long, over half again as long as combined length of head and pronotum, 277:158; proportion of segments one to four 48:82:80:67. Rostrum long, reaching to hind margin of fifth abdominal segment, the first segment almost attaining front coxae; proportion of segments one to four 48:82:80:67.

Pronotum subequal to head on median line, 77:78; nearly twice as wide across humeri as long, 160:77; disk strongly elevated behind, depressed around callosities; antero-lateral angles without spines or tubercles, the antero-lateral margins lobulately rounded (fig. 6a).

Hemelytra subparallel at bases of costal margins, extending about half the length of scutellum.

Color brown above, with piceous head, dark brown callosities, white at apices of antenniferous tubercles, along anterior margin, at four spots on disk of pronotum behind callosities, at apex of scutellum, and pale spots over most of clavus and corium. Membrane brown with very faint pale spots. Antennae and rostrum pale brown, the latter with apex black. Under surface with edges of bucculae and acetabula pale. Coxae and trochanters brown. Femora brown with an ill-defined pale ring beyond middle and another subapically. Tibiae brown with a faint ring subbasally and another subapically. Tarsi pale basally.

Size: male, length 8 mm., width (pronotum) 2.5 mm.; female, length 9.8 mm., width (pronotum) 3.1 mm.

Redescribed from a male, Tantalus, Oahu, September 1906 (R. C. L. Perkins). This is the specimen figured in Zimmerman (1948, fig. 39). A large female from the same series was taken to show the extremes in measurement above. A long series is at hand, mostly from Tantalus, collected by Perkins, Swezey, and J. W. Smith. Two small but otherwise typical specimens were collected by F. X. Williams, at Haleauau, in the Waianae Mts., Dec. 1, 1929. The type locality is stated by Zimmerman (1948) to be Konahuanui. A specimen from this locality is in the J. A. Kusche collection at the California Academy of Sciences. Kirkaldy's (1908) variety *picea* falls within the range of this dark species and was described from the Koolau Mtns. where *contracta* occurs. It is not rec-

ognized here.

In the female the rostrum appears to reach further (7th segment) because of the modifications of the venter to accommodate the ovipositor. The first rostral segment actually reaches the front coxae in some specimens.

Nesoclimacias lanaiensis Kirkaldy

Metrarga (Nesoclimacias) lanaiensis Kirkaldy, 1908, PROC. HAW. ENT. SOC. 1:189.

Elongate oval, the surface glabrous and minutely pubescent, at least on head, pronotum and scutellum.

Head broader across eyes than long, 35:30, the interocular space about three times as wide as an eye 21:7. Antennae missing on the type. Rostrum surpassing hind coxae but extending only onto third (second visible) ventral segment, (the specimen is partially broken between pro- and mesothorax so this character is difficult to make more precise). The first rostral segment extends about to anterior fourth of prosternum but definitely not to front coxae; proportion of segments one to four 28:25:20:17.

Pronotum as long as head on median line, 30:30; nearly twice as wide across humeri as long, 58:30; the front lobe with sides rounded and a little dilated, four-fifths as wide as posterior width across humeri, 46:58. Disk with a distinct raised median longitudinal carina and with humeri prominently raised.

Hemelytra relatively short with costal margins arcuate, the ratio of total length of hemelytron (to tip of membrane): greatest width (at level of apex of corium) 120:44; the length of corium (on same scale) 100, the length of clavus 56. (Comparable figures for typical *contracta* are 130 long by 35 greatest width, the hemelytra thus being longer and narrower and the costal margin less curved).

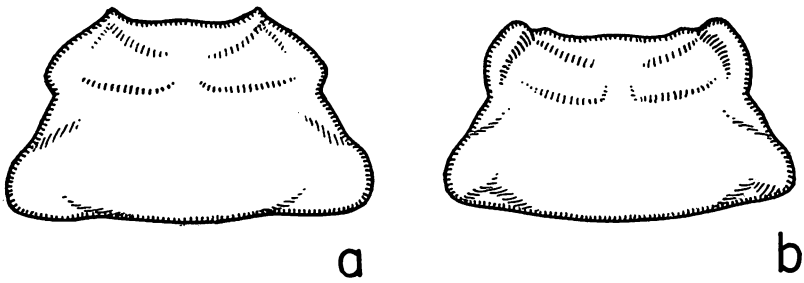


Figure 6. Pronota of: a) *Nesoclimacias contracta* (Blackburn), b) *Nesoclimacias lanaiensis* Kirkaldy (Molokai specimen).

Color brown with head darker, black, legs brown with apices of coxae, trochanters, and bases of tarsi paler, the femora each with a pale ring subapically and an ill-defined pale area at apex. Corium and membrane with numerous pale spots quite unlike typical *contracta*.

Size: length 7.7 mm., width (pronotum) 2.4 mm.

The holotype (British Museum) is a male, Lanai, 2000 ft., Perkins, XII, 1893. This is the specimen referred to by Kirkaldy (1908) in his original description. The second specimen labelled Halepaakai, Perkins, XII, 1894, is only a single hemelytron. The type has both hemelytra removed but one is carded below on the same pin. Kirkaldy (and Perkins, fide Kirkaldy) were in error in assuming that the Fauna Hawaiiensis figure 43 is of this. The figure looks like a typical Oahu *contracta* and, indeed, there are two specimens carded together "Konahuanui Ridge, XI, 1900" that bear a red label (as does *lanaiensis!*) saying "figured specimen".

A male from Kainalu, Molokai, 2000–3000 ft., *Freycinetia* (E. H. Bryan, Jr.) seems to belong here. The pronotum is shown in fig. 6b. The ratio of antennal length to combined lengths of head and pronotum is 265:141. The proportions of segments one to four are 30:75:75:65.

Genus **Nesocryptias** Kirkaldy

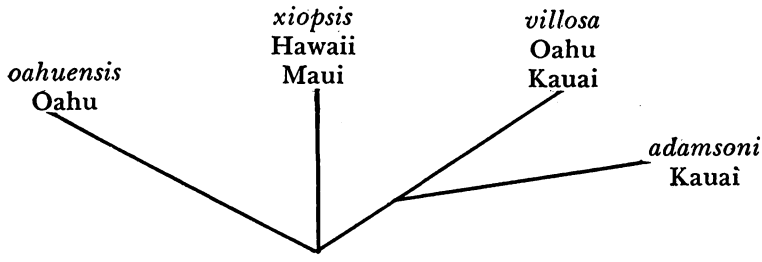
Nesocryptias Kirkaldy, 1908, PROC. HAW. ENT. SOC. 1:189 (as subgenus).

Nesocryptias Kirkaldy, 1910, FAUNA HAW. 2:534 (as subgenus).

Nesocryptias, Zimmerman, 1948, INS. HAWAII 3:110 (as genus).

Elongate oval in form, subflattened above and rather strongly convex beneath. Antenniferous tubercles short but distinct, briefly produced beyond bases of antennae, feebly divergent, rounded at apices. Rostrum reaching third or fourth visible abdominal segment, the first segment surpassing base of head. Pronotum variously developed, transverse, the lateral margins slightly to strongly sinuate, the antero-lateral angles rounded or strongly, roundly ampliate. In the latter case the pronotum may be broader across these antero-lateral expansions than across the humeri. Scutellum nearly or quite as long as wide at base. Commissure of clavus relatively long, in some cases nearly as long as scutellum. Hemelytra divergent from the base but with the costal margins dilated only behind basal eighth. Costal margins without strigil. Corial veins inconspicuous. Membrane greatly reduced, extending less than half as far beyond apices of coria as its length in front of this, the width of membrane much less than greatest width of corium. Hind wings reduced to brief pads, shorter than scutellum or entirely absent. Parameres broadly rounded and sinuate basally, attenuated and moderately curved apically, not very long and not roundly elbowed. Size relatively small, 4½ to 6 mm.

Type of genus: *Metrarga villosa* Buchanan White.
Recorded from Kauai, Oahu, Maui, and Hawaii.



Relationships of the species of *Nesocryptias*

KEY TO THE SPECIES OF NESOCRYPTIAS

1. Width across anterior lobe of prothorax equal to or greater than across posterior lobe. Oahu ..... **oahuensis**
   Width across anterior lobe of prothorax less than diameter across posterior lobe 2

2. Constriction of prothorax at about the middle. Hawaii, Maui ... **xiopsis**
   Constriction at the posterior third of prothorax 3

3. Lateral margins of anterior lobe of pronotum strongly arcuate, corium with thick appressed pile. Oahu, Kauai ..... **villosa**
   Lateral margins of anterior lobe of pronotum nearly straight, corium with a scattering of appressed hairs. Kauai ..... **adamsoni**

Nesocryptias oahuensis, new species

Body elongate oval, surface dull. Head and lateral margins of prothorax with dense hairs, remaining parts with sparse short appressed hairs.

Head wider across eyes than long, 72:62, ratio of interocular space to width of an eye 46:12. Vertex obscurely punctate. Ocelli absent. Antenniferous tubercles short, about as long as broad at base, apex blunt. Antennae longer than head and pronotum together, 177:116, proportions of segments 38:43:53:43. Rostrum attaining middle of fourth (third visible) abdominal segment, first segment surpassing base of head, proportions of segments one to four 51:52:40:33.

Pronotum at middle shorter than head, 56:62, anterior lobe strongly

rounded, wider than width across posterior lobe, 90:86, construction between lobes nearly at posterior two-thirds. Disk depressed, lateral margins somewhat raised, callosities slightly raised, median carina prominent anteriorly only (fig. 7a).

Scutellum not as wide as long, 42:51, disk raised antero-laterally with carinae to each lateral angle.

Hemelytra with costal margins very slightly constricted before expanded portion.

Color dark brown, pronotum with a few pale areas between punctures, hemelytra opaque, of uniform color, membrane hyaline brown. Antennae brown, fourth segment dark brown. Rostrum light brown, dark brown at apex. Legs light yellow brown, with three broad light brown anulations on each femur and tibia, tarsi brown.

Size: male, length 4.8 mm., width 1.5 mm.; female, length, 5.4 :nm., width (pronotum) 1.7mm.

Holotype: Mt. Olympus, Oahu, on *Freycinetia* (ieie vine) Oct. 6, 1935, (R. L. Usinger), (B. P. Bishop Museum). Allotype: same data as holotype, (B. P. Bishop Museum). Paratypes: two females, same data as holotype, (U. S. National Museum); one male and two females, Mt. Olympus, Oahu, on *Bryonia,* Oct. 6, 1935 (R. L. Usinger), (one in B. P. Bishop Museum, two in collection of R. L. Usinger); one female, Mt. Olympus, Oahu, 2300 ft., Aug. 23, 1936 (F. X. Williams), Expt. Sta., H.S.P.A.); one female, Mt. Tantalus, Oahu, June, 1952 (M. Adachi), (Univ. of Hawaii); one specimen, Lanihuli side of Nuuanu about 2000 ft. in dead leaves, Jan., 1902 (R. C. L. Perkins), (B. P. Bishop Museum); one specimen Waiolani, Oahu, (Brit. Mus. Nat. Hist.).

Nesocryptias xiopsis, new species

Body elongate oval, surface shining with sparse vestige of fine appressed hairs.

Head wider across eyes than long, 80:66, ratio of interocular space to one eye 48:16; vertex obscurely punctured, ocelli reduced. Antenniferous tubercles blunt, short, wider across base than long. Antennae longer than head and pronotum combined, 196:126, proportion of segments one to four 43:52:49:52. Rostrum attaining base of fourth (third visible) abdominal segment, first segment attaining base of head, proportions of segments one to four 58:56:47:36.

Pronotum at middle slightly shorter than head, 60:66. Anterior lobe strongly rounded, narrower than width across posterior lobes, 95:110, constriction between lobes at about the middle (fig. 7b); disk depressed, lateral lobes prominent, slightly raised in front of callosities, median carina prominent anteriorly and posteriorly, obscured through most of disk.

Scutellum slightly wider than long, 60:54, raised in middle of disk.

Hemelytra not at all constricted before expanded portion.

Color dark reddish brown. Pronotum with pale spots at anterior and posterior ends of median carina. Hemelytra with obscure pale spots throughout, membrane hyaline brown. Antennae with segments one and two light brown, three and four dark brown, joints pale. Rostrum light brown with brown apex. Legs pale yellow brown with three light brown annulations on each femur and tibia, tarsi light brown.

Size: male, length 5.4 mm., width (pronotum) 1.8 mm.; female, length 5.4 mm., width (pronotum) 1.8 mm.

Holotype: male, Kaiwiki, Hawaii, Sept. 22, 1918 (O. H. Swezey), (B. P. Bishop Museum). Allotype: female, same data as holotype, (California Academy of Sciences).

The specimen from Lahaina, Maui (Koebele) figured by Kirkaldy (1902; fig. 44) as "villosa" belongs here. The pubescence is only moderately distinct and the costal margins are much more strongly sinuate than in the figure.

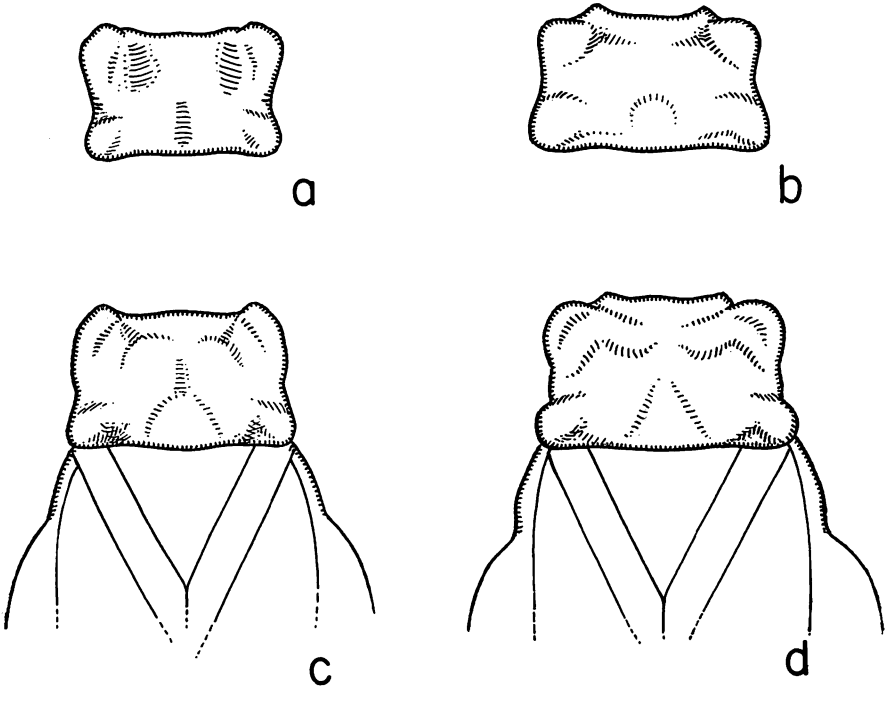


Figure 7. Pronota of: a) *Nesocryptias oahuensis*, n. sp., b) *Nesocryptias xiopsis*, n. sp., c) *Nesocryptias villosa* (B. White), d) *Nesocryptias adamsoni*, n. sp.

Nesocryptias villosa (Buchanan White)

Metrarga villosa Buchanan White, 1878, ANN. MAG. NAT. HIST. (5) 1:371.

Body elongate, obovate. Surface dull, usually covered with appressed clumped hairs on head, thorax, scutellum and curvaceous part of hemelytra. Abdomen and legs with shorter spaces of appressed hairs.

Head a little wider across eyes than long, 72:64; ratio of interocular space to width of an eye 47:11. Vertex finely punctured. Ocelli reduced. Antenniferus tubercles short, slightly wider at base than long, blunt at apex. Antennae longer than head and pronotum together, 185:124, proportion of segments one to four 34:49:55:46. Rostrum attaining middle of third (second visible) abdominal segment, first segment just attaining base of head, proportions of segments one to four 43:55:47:40.

Pronotum at middle slightly shorter than head, 64:60, anterior lobe broadly rounded, narrower than width across posterior lobes, 95:99, constriction between lobes at about the posterior two-thirds (fig. 7c). Disk depressed with humeri and lateral margins of anterior lobe prominent, with raised areas anteriorly to either side of midline, extending through callosities, then diverging laterally, median carina prominent at anterior margin of pronotum, becoming obscure at about middle.

Scutellum about as wide as long, 60:58, glabrous in lateral angles, disk with strongly raised "Y"-shaped area, greatly depressed anteriorly.

Hemelytra with costal margins slightly constricted before expanded portion.

Color brown, punctures dark brown, head dark brown with antenniferous spines somewhat paler. Pronotum anteriorly dark brown, lateral margins and posterior lobe light brown, median carina with pale spot at anterior margin. Scutellum dark brown, posterior two-thirds of lateral margin and apex light brown. Hemelytra brown and opaque, with indistinct pale areas on disk, and alternating dark and pale patches on expanded lateral margins, claval suture pale, membrane brown with indistinct transparent patches. Under surface brown, abdomen mottled with dark and pale patches. Antennae brown with pale joints, base of first segment paler, third and fourth segments slightly darker. Rostrum pale brown with dark brown apex. Legs pale yellow brown with three dark brown annulations on each femur and tibia, tarsi brown.

Size: male, 5.3 mm., width (pronotum) 1.7 mm.; female, 6.0 mm., width (pronotum) 1.9 mm.

The type and a "cotype", both males, in the British Museum (Nat. Hist.) are labelled "No. 25, Honolulu". All records are in the vicinity of Tantalus and Nuuanu Pali except for Blackburn's specimens which are marked only with the Oahu symbol. Three specimens that may belong here are before us from Kauai-Kumuela, Dec. 28, 1935 (R. L. Usinger), and 4000 ft., Mar. 3, 1919 (J. A. Kusche).

Many of the specimens in the series (including the three Kauai specimens) lack the strongly villose vestiture of the described specimens from Blackburn's series, yet agree in all other respects.

Nesocryptias adamsoni, new species

Body elongate obovate, surface shining. Head, lateral margins of pronotum, and bases of costal margins with dense hairs, remaining parts appearing glabrous, but with sparse short hairs throughout.

Head a little wider across eyes than long, 82:72, ratio of interocular space to width of an eye 54:14, vertex obscurely punctate. Ocelli reduced. Antenniferous tubercles short, but longer than wide at base, blunt at apex. Antennae longer than head and thorax combined, 221:143, proportion of segments one to four 51:55:60:55. Rostrum incomplete, first segment surpassing base of head, proportion of segments one and two 65:61.

Pronotum at middle subequal to head, 71:72, anterior lobe broadly rounded, narrower than width across posterior lobe, 105:119, constriction between lobes at about posterior two-thirds (fig. 7d). Disk depressed, particularly behind callosities, lateral margins of anterior lobe and posterior lobe prominent, callosities raised, median carina raised at anterior margin, obscure posteriorly.

Scutellum about as wide as long, 65:67, disk strongly raised medially.

Hemelytra with costal margins slightly arcuate basally, then strongly curving outwardly to expanded portion, which is more rounded than in other species of the genus.

Color reddish brown, head dark reddish brown. Prothorax with a few pale areas between punctures, scutellum with pale apex, hemelytra of nearly uniform color with obscure pale spots in expanded costal area, membrane hyaline brown, with paler spots. Antennae light brown, fourth segment slightly darker. Rostrum and legs light brown.

Size: male, length 5.9 mm., width (pronotum) 2.0 mm.; female, length 6.4 mm., width 2.1 mm.

Holotype: male, Alakai Swamp, Kauai, July 10, 1928 (A. M. Adamson), (B. P. Bishop Museum). Allotype: female, Kumuwela, Kauai, June 27, 1932, on *Osmanthus* (O. H. Swezey), (B. P. Bishop Museum).

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